
Executive Summary

In adopting the Regional Wastewater Services Plan (RWSP) in 1999, the Metropolitan King County Council recognized that the RWSP was a complex and dynamic plan that would require regular review and updates. The Council specifically called for a review of the benefits of the combined sewer overflow (CSO) control program, an essential component of the RWSP.

The Wastewater Treatment Division (WTD) of the Department of Natural Resources and Parks completed the CSO control program review over the last several years. The results of the review indicate that the program, as detailed in the RWSP, continues to be a sound program to control all of the County's CSOs by 2030. WTD recognized the value of this review and will conduct similar reviews on a regular basis ahead of CSO control plan updates. The next review will occur in 2010.

Accomplishments of the CSO Control Program

Years ago, the common wastewater management practice was to provide a single sewer pipe to carry both wastewater and stormwater. Such pipes were called "combined sewers." Until the early 1940s, nearly all sewers constructed in the City of Seattle were combined sewers that simply carried waste to the nearest body of water without treatment. Treatment plants were slowly added to the system. During large storms, combined sewers may collect more stormwater than the pipes and treatment plants can handle. Combined sewer overflow (CSO) outfalls act as relief points for this excess flow to protect treatment plants from huge influxes of water and to prevent wastewater from backing up into streets and basements. The City of Seattle owns about 100 and King County owns 38 CSO outfalls.

Although they are highly diluted, CSOs release potentially harmful bacteria and pollutants, may cause aesthetic degradation, and may reduce sediment quality near the discharge sites. Regulations, agreements, policies, and public perceptions require, either directly or indirectly, the reduction of CSOs to protect water quality, sediment quality, and aquatic species in our water bodies. The Washington State Department of Ecology (Ecology) requires agencies to "control" CSOs so that an average of no more than one untreated discharge occurs per year at each CSO site. The most recent CSO control plan, prepared as a part of the RWSP and updated in 2000, calls for control of all King County CSOs by 2030.

The WTD CSO control program implements the CSO control plan. The program employs various ways to control CSOs, including controlling pollution at its sources, optimizing flow management, monitoring and modeling flows in the system, and constructing CSO control facilities.

Projects to control CSOs in the region began in the late 1970s. So far, about \$320 million has been spent to control CSOs and another \$383 million is planned to implement the CSO control projects in the RWSP. In 2005, two major facilities were finished: the Mercer/Elliott West system, completed at a cost about \$140 million, and the Henderson/Norfolk system, completed at a cost of \$77 million. Both systems include a large storage/treatment tunnel and additional treatment facilities.

Since 1988, when routine monitoring of CSO flows began, the CSO control program has resulted in significant progress. CSO volumes have been reduced by nearly 60 percent, from an estimated 2.4 billion to approximately 900 million gallons per year. The County is committed to completing this work by 2030. A graph of progress since 1988 and expected progress through 2030 is shown in Figure ES-1.

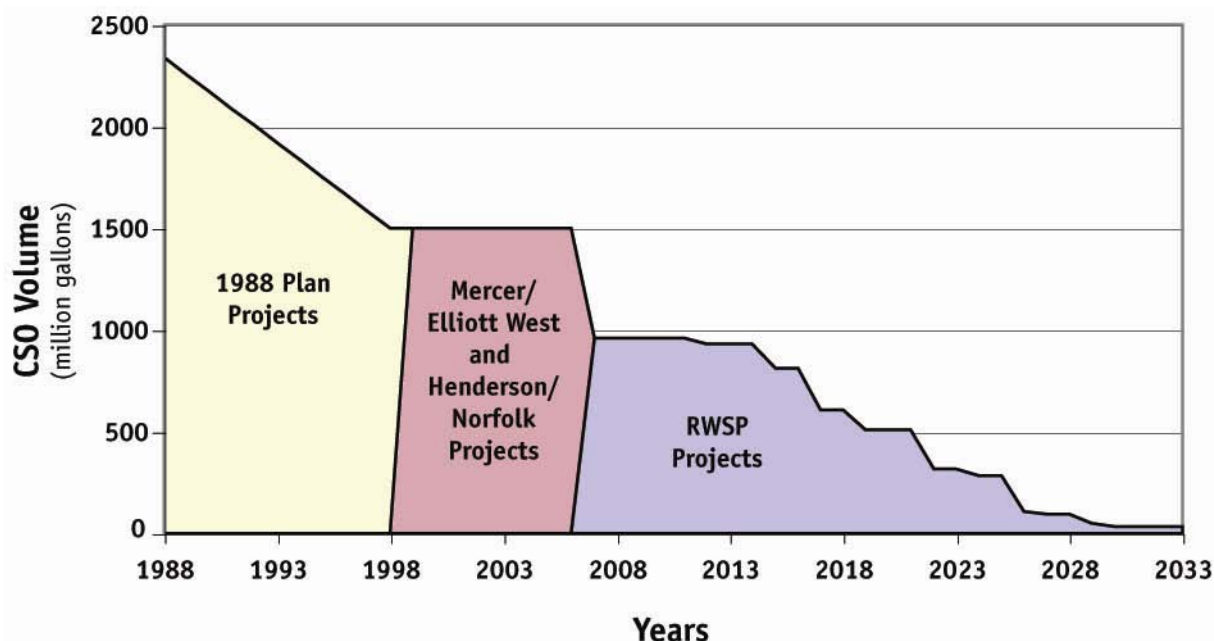


Figure ES-1. CSO Reduction Since 1988

Highlights of the CSO Control Program Review

To conduct the CSO control program review, King County staff have gathered and assessed information generated since adoption of the RWSP. The review has identified areas of efficiency and success, as well as areas where improvements to the program could be made. These improvements are being implemented.

This CSO program review reaffirms the RWSP priorities of protecting public health, the environment, and endangered species that shaped the development of the CSO control program. It also has reinforced WTD's practice of transferring as many CSO flows as possible to regional plants for best available treatment. In keeping with the RWSP schedule, predesign will begin in mid 2006 on projects with the greatest benefit to human health protection—the Puget Sound

Beach projects. These projects are storage or conveyance projects that will transfer flows to the West Point plant. State Revolving Fund loans will help to pay for preparation of facility plans for three of these projects.

This review revealed upward cost pressures on the CSO control program. Changes in the market and regulatory guidance may require further exploration of alternative CSO treatment technologies and subsequent changes to design of CSO control facilities. New technologies that offer some promise for greater cost-effectiveness will be piloted between 2006 and 2009.

As a result of the review, the hydraulic model used to predict the effectiveness of CSO control and to design CSO control projects is being updated and recalibrated. The updated model is expected to be ready in 2007. When the model is updated, projects may be resized, cost-effective technology changes may be incorporated, and new cost estimates will be developed.

The remainder of this section summarizes the review process, its conclusions, and any remaining issues. It is organized according to the topics listed in the RWSP for the CSO control program review:

- Maximizing the use of existing CSO control facilities
- Identifying the public and environmental health benefits of continuing the CSO control program
- Ensuring that projects are in compliance with new regulatory requirements and objectives such as the Endangered Species Act and the Wastewater Habitat Conservation Plan
- Analyzing rate impacts
- Ensuring the program review will honor and be consistent with long-standing commitments
- Assessing public opinion
- Integrating the CSO control program with other water and sediment quality improvement programs for the region

Maximizing the Use of Existing CSO Control Facilities

As a part of the CSO program review, WTD inventoried its existing practices that relate to CSO control. In addition, each CSO facility and rain gauge was physically inspected and monitoring data were reviewed to assess the status of CSO control. Improvements were made based on these inspections and review. The scope was then broadened to include employee input on ways to enhance control program organization, coordination, and communication.

This review highlighted WTD's practice to ensure that combined sewage receives the best treatment possible by sending as much flow as possible to regional plants. CSO control facilities, such as storage or satellite treatment facilities, are built to manage peak flows that occur between 1 and 30 times per year. As such, they operate as backup to the transfer of flows to regional treatment plants—operating only when flows cannot be immediately conveyed to these plants.

These facilities will be used infrequently to achieve the regulatory control standard and provide optimum treatment to all flows.

Identifying the Public and Environmental Health Benefits of Continuing the CSO Control Program

During this program review, WTD took a fresh look at existing information, reviewed new information, and completed studies to assess—both quantitatively and qualitatively—the health benefits to the public, environment, and endangered species of bringing all CSOs under control. The assessment drew from studies describing existing environmental conditions and predicted conditions at the completion of the program. It built on the findings of the County’s 1998 *Water Quality Assessment of the Duwamish River and Elliott Bay* (WQA) and 1999 *Sediment Management Plan*—both done in support of the RWSP—and on subsequent annual RWSP water quality reports.

Knowledge from recent scientific studies does not warrant any change in course. The primary benefit from the CSO control program remains the reduction in public health risk from pathogens—bacteria and viruses—found in CSOs. People enjoying our waterways—experiencing the power of storm-driven waves, prime windsurfing, and diving during the best winter months—will be more confident about the quality and safety of these recreational activities.

Many recent studies have focused on the Duwamish River because of sediment cleanup projects in the area. With regard to protection of human health, information generated from the Lower Duwamish Waterway Superfund process is increasing our understanding of fish consumption and human health risk. Studies under way may shed more light on whether these risks result from historical sediment contamination or from an ongoing contribution from CSOs and other sources. If an ongoing human health risk from CSOs in the Duwamish River is identified, King County may consider changes in the control schedule to accelerate the CSO control projects in these locations. Determining relative priorities will be difficult because comparable information is not as available for other areas where CSOs occur, such as Elliott Bay, the Ship Canal, and the East and West Waterways of the Duwamish River.

With regard to protection of salmon, the perception that CSOs are harmful must consider that the area with the greatest volume of overflow—the Duwamish River—has the healthiest run in terms of numbers of both hatchery and naturally spawning fish. At this time, protection of endangered salmon does not appear to be enhanced by changes in the CSO control schedule that would prioritize the Duwamish River over other locations.

Ensuring that Projects Are in Compliance with New Regulatory Requirements and Objectives Such as the Endangered Species Act and the Wastewater Habitat Conservation Plan

King County has a strong history of compliance with regulations regarding its CSO discharges—both treated and untreated. The County also responds quickly to changes in regulations and even works to anticipate these changes. For example, WTD’s support of the watershed planning process and the studies for the Habitat Conservation Plan will ensure that the CSO control plan and projects meet the objectives of the Endangered Species Act.

WTD’s CSO treatment facilities meet the regulatory limits for their discharges with few exceptions. The CSO control plan laid out in the RWSP was devised to ensure that the County continues to make steady progress in meeting Ecology’s CSO control standard of an average of one untreated CSO discharge per year at each CSO location by 2030.

The design of CSO control facilities must consider not only current regulatory requirements but also possible changes in the requirements in the next 5 to 10 years. Even with this ongoing vigilance, unexpected changes in regulations and methodologies to implement the regulations can occur that may affect program planning and implementation. For example, between the planning phase and the permitting of the new Mercer/Elliott West and Henderson/Norfolk CSO storage and treatment facilities, Ecology changed the methods to identify the need for and define effluent permit limits. WTD will monitor these facilities for their compliance with these permit limits and will include the new methods in planning for future projects. In addition, promising treatment technologies will be evaluated for their ability to meet possible future requirements in pilot projects proposed for 2006–2009.

Analyzing Rate Impacts

The RWSP CSO control program recommended that 21 projects be built between 2005 and 2030. The total project constant capital cost for these projects was estimated to be \$311 million in 1998. In 2005 dollars, the projects are estimated to cost \$383 million.¹ The project schedule for the RWSP CSO control program was designed to spread costs over time and to support a stable sewer rate. The current RWSP program without recommended refinements and updated estimating will contribute \$0.27 per month to rates in 2010, \$2.45 in 2020, and \$4.65 in 2030.²

Cost estimating involves a narrowing process so as to limit resources and time spent on alternatives that will be discarded. The accuracy of cost estimates increases as projects become more defined and are specified in greater detail. Planning-level cost estimates, such as those used

¹ In addition to accounting for 3 percent per year inflation, this total reflects the deletion of the SW Alaska Street CSO project and the addition of CSO plan updates and sediment management activities that were mandated but not funded in the RWSP. (Monitoring and analysis indicate that the CSO at SW Alaska Street is controlled.) See Appendix C for a table that summarizes current RWSP project costs.

² These rates include 3 percent inflation per year, starting from 2005 dollars. The rates without inflation would be \$0.23, \$1.63, and \$2.22 for the same years.

in the RWSP, are based on generic facility concepts. Specific details of the project such as location, technologies, and environmental impacts are determined later during project predesign.

No detailed analysis of CSO project costs has been done since the RWSP because an update of the hydraulic model—recommended by this review and currently under way—will likely change sizes, definitions, and thus costs of several planned control projects. However, similar to increased estimates seen for the original RWSP “North Plant” (Brightwater) and conveyance program, increased estimates for CSO control projects can be expected. WTD has begun two activities that have the potential to offset the cost increases that appear could result from changes in market conditions and estimating methods:

- The hydraulic model is being updated and calibrated so that it can more accurately update and refine project sizing.
- Pilot tests will be conducted on promising new CSO treatment technologies that may reduce facility footprint and cost.

These activities are expected to produce new project definitions and improved cost estimates for a next CSO control plan review in 2010.

Ensuring the Program Will Honor and Be Consistent With Long-Standing Commitments

The CSO control plan represents a responsible approach to controlling CSOs on behalf of the 34 local agencies that contract with King County for wastewater conveyance and treatment. The plan takes into account commitments made to these agencies and to communities and regulatory agencies through agreements and other mechanisms.

WTD continues its commitment made to the public and Ecology to make steady progress toward control of all of its CSOs by 2030. Scheduling flexibility is maintained within that timeframe to take advantage of concurrent or joint project opportunities or to respond to changing needs. In keeping with RWSP policy commitments, the plan will be modified, when needed, to respond to emerging developments in science and technology.

Assessing Public Opinion

WTD’s ongoing public involvement program informs and engages the public and local agencies in planning, design, and operating decisions that affect them. Public involvement activities helped to shape the RWSP, including its CSO control element.

The 1998 CSO water quality assessment was conducted with valuable input from regional stakeholders. This stakeholder process, along with other public opinion surveys conducted during formulation of the RWSP, indicated that water quality is a priority to the citizens of King County, that the County has a mandate to protect and enhance water quality, and that the citizens believe CSOs should be controlled. In one survey done for the RWSP, 75 percent of the respondents said that CSOs should be prevented even if it increases sewer rates.

The County has continued to assess public opinion through annual surveys and community involvement work on other wastewater projects. The message heard during RWSP formation has been continually reaffirmed through all WTD public involvement activities since the RWSP was adopted. In its recent annual water quality survey, King County repeated the same questions asked in 1997 and heard similar results: 79 percent of respondents said that the County should prevent CSOs into Puget Sound, rivers, and lakes during storms, even if it increases sewer rates; only 4 percent believed controlling CSOs was not worth such investments.

The messages heard to date, information resulting from this program review, and any new public opinion heard during the plan updating process will shape the program to be in keeping with the expectations of our citizens.

Integrating the CSO Control Program with Other Water and Sediment Quality Improvement Programs for the Region

To save costs, improve efficiencies, and reduce redundancies, the CSO control program integrates its work with both internal and external programs aimed at improving water and sediment quality in the region.

The CSO control program makes every effort to coordinate CSO control projects with wastewater system upgrade and refurbishment projects to optimize designs, share mutual project costs, and minimize community disruption. For example, upgrades to the Barton Pump Station were expanded to the maximum capacity that the station can accept in order to minimize the size of the anticipated CSO control project. Likewise, emergency repairs of the Barton force main and Ballard siphon have considered CSO control plans to the extent possible without delaying the repairs. The siphon repair may control CSOs at the Ballard location without the need for a later control project.

WTD and the City of Seattle are consulting on ways to coordinate CSO control projects in overlapping areas and to handle the addition of more City CSO flows into the County conveyance and treatment system. The RWSP defined the Ballard CSO control project as a joint project with the City. Now that the need for the Ballard project may be eliminated, WTD has offered the City the opportunity to contribute incremental costs to provide capacity in the siphon for the City's Ballard CSOs. If the City wishes to explore this opportunity further, the implications for siphon sizing, buildability, and West Point capacity will be assessed. Other projects that will be evaluated include the City's Windermere and the County's University Regulator projects, as well as a possible joint storage project in the Madison Valley and Montlake areas. These and any other opportunities for coordination will be considered in the 2008 update to the CSO control plan.

Next Steps

When the hydraulic model is updated, projects will be resized, any necessary technology changes will be incorporated, and new cost estimates will then be developed. Some of this information, including any recommended schedule changes to address new scientific information, may not be

available for the next plan update due to Ecology in 2008; all the information should be available for public discussion ahead of the next CSO control program review in 2010—and well ahead of commitments to Ecology for the CSO plan update that follows the review.